

REMARKS

I. Status of Claims

Prior to this amendment, claims 51-100 were pending. Without prejudice or disclaimer, claims 74, 75, 86, 87, 98, and 99 are cancelled herein.

Further, claims 51, 76, and 88 are amended to incorporate the limitations of claims 74 & 75, 86 & 87, and 98 & 99, respectively. Specifically, claims 51, 76, and 88 are amended to recite that the elastomeric composition also comprises “at least one reinforcing filler comprising silica” and “at least one silica coupling agent.” As a result of this amendment, claims 72, 73, 84, 85, 96, and 97 are also amended herein and claims 101 to 103 are added herein. Thus, no new matter is introduced.

Applicants acknowledge the withdrawal of the rejections over U.S. Patent No. 4,602,052 to Weber et al. (“Weber”) and further in view of JP 11-116653 (“Tokumoto”); over Weber and Tokumoto as applied in claim 51 and further in view of U.S. Patent No. 6,550,508 to Yamaguchi et al. (“Yamaguchi”); over Weber and Tokumoto as applied in claim 51 and further in view of U.S. Patent No. 7,199,175 to Vasseur (“Vasseur”); over U.S. Patent No. 6,982,050 to Chauvin et al. (“Chauvin”) further in view of Tokumoto; and over Chauvin and Tokumoto as applied in claims 74, 86, and 98 and further in view of U.S. Patent No. 5,681,874 to Lucas et al. (“Lucas”).

II. Rejections Under 35 U.S.C. § 103(a)

A. Weber

The Examiner rejects claims 51-62, 65-67, 72, 73, 76-79, 81, 82, 84, 85, 88-91, 93, 94, 96, 97, and 100 under 35 U.S.C. § 103(a) as being unpatentable over Weber. See Nov. 14, 2007, Office Action at 2-5. In particular, the Examiner alleges that “Weber

teaches the use of any quaternary ammonium salt (Column 4, Lines 20+)," and "[m]ore particularly, Weber incorporates [U.S. Patent No. 3,686,113 to Burke ("Burke")] by reference and suggests the use of ammonium salts listed between Column 5, Lines 11 – Column 7, Line 75." *Id.* at 2. The Examiner points to the salts listed in Burke on column 6, lines 15-30, which allegedly "satisfy the structure of the claimed invention." Nov. 14, 2007, Office Action at 3. The Examiner also argues that Applicants have "not provided a conclusive showing of unexpected results to establish a criticality for the claimed ammonium salt." *Id.*

Applicants respectfully traverse this rejection because the Examiner has failed to establish, as required by M.P.E.P. § 2143, a *prima facie* showing of obviousness. With respect to obviousness, several basic factual inquiries must be made in order to determine the obviousness or non-obviousness of claims under 35 U.S.C. § 103. These factual inquiries, set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 U.S.P.Q. 459, 467 (1966), require the Examiner to:

- (1) Determine the scope and content of the prior art;
- (2) Ascertain the differences between the prior art and the claims in issue;
- (3) Resolve the level of ordinary skill in the pertinent art; and
- (4) Evaluate evidence of secondary considerations.

The obviousness or nonobviousness of the claimed invention is then evaluated in view of the results of these inquiries. *Graham*, 383 U.S. at 17-18, 148 U.S.P.Q. at 467; *see also KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1730, 82 U.S.P.Q.2d 1385, 1388 (2007).

Indeed, to establish a *prima facie* case of obviousness, the Examiner must:

make a determination whether the claimed invention “as a whole” would have been obvious at that time to that person. Knowledge of applicant’s disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the “differences,” conduct the search and evaluate the “subject matter as a whole” of the invention. The tendency to resort to “hindsight” based upon applicant’s disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

M.P.E.P. § 2142. “The key to supporting any rejection under 35 U.S.C. § 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious.”

Id. It is important to note, moreover, that the prior art references relied upon in a rejection “must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention,” when such reasons are articulated by the Examiner. M.P.E.P. § 2141.03(VI); *see also Graham*, 383 U.S. at 17, 148 U.S.P.Q. at 467.

The Examiner has not established a *prima facie* case of obviousness because the claimed invention as a whole would not have been obvious in view of Weber or Burke, when considered as a whole. Specifically, neither Weber nor Burke teaches or suggests the claimed quaternary ammonium salt.

Nevertheless, in order to expedite prosecution, but without acquiescing to the Examiner’s rejection, Applicants have amended claims 51, 76, and 88 to incorporate the limitations of claims 74 & 75, 86 & 87, and 98 & 99, respectively. Specifically, claims 51, 76, and 88 are amended to recite that the elastomeric composition also comprises “at least one reinforcing filler comprising silica” and “at least one silica coupling agent.” Applicants note that the Examiner did not reject claims 74, 75, 86, 87, 98, and 99 as

obvious in view of Weber. Accordingly, Applicants respectfully submit that this rejection should be withdrawn for at least this reason.

B. Weber in view of Yamaguchi

The Examiner rejects claims 63, 64, 80, and 92 under 35 U.S.C. § 103(a) as being unpatentable over Weber as applied in claim 51 above and further in view of Yamaguchi. See Nov. 15, 2007, Office Action at 5. Applicants respectfully traverse this rejection for at least the following reason. Claims 63, 64, 80, and 92 depend from claims 51, 76, and 88, which incorporate the limitations of claims 74, 75, 86, 87, 98, and 99. As noted above, the Examiner found claims 74, 75, 86, 87, 98, and 99 to be not obvious in view of Weber. Further, the Examiner has not rejected claims 74, 75, 86, 87, 98, or 99 as obvious over Weber in view of Yamaguchi. Thus, Applicants respectfully request that the Examiner withdraw this rejection for at least these reasons.

C. Weber in view of Vasseur

The Examiner rejects claims 68-71, 83, and 95 under 35 U.S.C. § 103(a) as being unpatentable over Weber as applied in claim 51 above and further in view of Vasseur. See Nov. 15, 2007, Office Action at 5. Applicants respectfully traverse this rejection for at least the following reason. Claims 68-71, 83, and 95 depend from claims 51, 76, and 88, which incorporate the limitations of claims 74, 75, 86, 87, 98, and 99. As noted above, the Examiner found claims 74, 75, 86, 87, 98, and 99 to be not obvious in view of Weber. Further, the Examiner has not rejected claims 74, 75, 86, 87, 98, or 99 as obvious over Weber in view of Vasseur. Thus, Applicants respectfully request that the Examiner withdraw this rejection for at least this reason.

D. Chauvin in view of Weber

The Examiner rejects claims 74, 86, and 98 under 35 U.S.C. § 103(a) as being unpatentable over Chauvin and further in view of Weber. See Nov. 15, 2007, Office Action at 5-6. The Examiner notes that Chauvin discloses a composition comprising a vulcanization system containing, among other things, at least one vulcanization amine activator selected from, among other things, quaternary ammonium salts. *Id.* (citing Chauvin, col. 3, line 58 – col. 4, line 24). The Examiner, however, concedes that Chauvin “fails to list specific types of said salts,” but relies on Weber to argue that “the claimed class of ammonium salts is known and more particularly, have been used in elastomeric compositions based on diene rubbers and having carbon black.” *Id.* at 6.

Applicants respectfully disagree and traverse for at least the following reasons.

First, as the Examiner recognizes, Chauvin merely discloses a composition, which comprises, among other things, “at least one vulcanization amine activator selected from the group formed of amines, guanidines, aldehyde and amine condensates, and quaternary ammonium salts.” Chauvin, col. 4, lines 9-11. However, Chauvin, like Weber or Burke, fails to provide the requisite motivation to choose the claimed subgenus of organic quaternary ammonium salts from the vast number of possible quaternary ammonium salts because it provides no preference for any particular salt. It has long been held that such a broad disclosure is insufficient. *Akzo N.V. v. U.S. Int'l Trade Comm.*, 1 U.S.P.Q.2d 1241, 1425 (Fed. Cir. 1986) (finding even though the term “sulfuric acid” encompasses “98% concentrated sulfuric acid,” that it did not constitute a disclosure of “98% concentrated sulfuric acid.”).

In fact, Chauvin provides even less of the necessary disclosure than Weber or Burke. Indeed, in only one example in Chauvin is a quaternary ammonium salt used. Specifically, Example 4.4 uses Aliquat® 336, the structure of which has a single nitrogen atom, which is positively charged. See Aliquat® 336 Product Data Sheet (attached herewith). Thus, Chauvin would not have motivated one skilled in the art to identify, select, and then use the claimed quaternary ammonium salts, which have one neutrally-charged nitrogen atom and one positively-charged nitrogen atom. If anything, one skilled in the art would have only been motivated to use a quaternary ammonium salt containing a single positively charged nitrogen. See M.P.E.P. § 2141.02(VI) ("A prior art reference must be considered in its entirety, *i.e.*, as a whole, including portions that would lead away from the claimed invention.") (citation omitted).

Second, Weber does not cure this deficiency. Specifically, for the reasons presented in the August 27, 2007, Response, Weber on its face does not teach or suggest the use of the quaternary ammonium salts of the claims. Moreover, Weber's incorporation by reference of Burke also does not correct this deficiency, in-part since not every composition disclosed by Burke is incorporated by reference into Weber. At column 4, lines 21-25, Weber carefully states that only "suitable" quaternary ammonium salts are incorporated by reference. This clearly suggests that not all quaternary ammonium salts of Burke are suitable and not all are incorporated by reference. In view of the remaining disclosure of Weber, as discussed in the August 27, 2007, Response, the only suitable quaternary ammonium salts of Burke are those with only positively charged nitrogen atoms.

Moreover, contrary to the Examiner's arguments, Burke does not disclose quaternary ammonium salts, where one nitrogen is neutrally charged and one nitrogen atom is positively charged. While the Examiner asserts that the salts described in column 6, lines 15-30 of Burke "satisfy the structure of the claimed invention" (Nov. 15, 2007, Office Action at 3), such a disclosure would be readily recognized by a person of ordinary skill as an obvious typographical error; not a disclosure of the quaternary ammonium salts of the claims.

Column 6, lines 15-30 of Burke discloses quaternary ammonium compounds derived from diamines allegedly represented by the following formulas:

Amine tertiary	Quater-nizing agent	Quaternary ammonium compound
$\begin{array}{c} R \\ \\ N-(CH_2)_x-N \\ \\ R' \quad R'' \\ \quad \\ R' \quad R' \end{array}$	CH ₃ Cl	$\left[\begin{array}{c} R \\ \\ N-(CH_2)_x-N-CH_3' \\ \\ R' \quad R''' \\ \quad \\ R' \quad R''' \end{array} \right]^+ Cl^-$

Burke further discloses, however, Redicote E-11 as a specific example of these compounds. See Burke, col. 6, lines 34-36. A person of ordinary skill in the art would know that Redicote E-11 has the formula: C₁₈H₃₇N(CH₃)₂ClC₃H₆N(CH₃)₃Cl. See, e.g., Burke, footnote 1 of Table VIII. Redicote E-11 is also known as N,N,N',N',N"-pentamethyl-N-tallowalkyl-1,3-propanediammonium chloride. See Redicote® E11 Safety Data Sheet from Akzo Nobel (attached herewith). Thus, a person of ordinary skill would know that Redicote E-11 has two nitrogen atoms, both of which are quaternized, i.e., have a positive charge. Contrary to the Examiner's position, therefore, Redicote E-11 does not satisfy formula (I) of the claimed invention, which requires that the claimed salt comprises a quaternary amine with a positive charge and a tertiary

amine that has no charge (the non-ionic nitrogen atom described in the specification as-published at ¶ [0014]). Thus, a person skilled in the art would recognize that Burke (and, hence Weber) does not teach or suggest the use of the claimed diamines.¹

Third, even if the Examiner were correct regarding Weber and Burke, there is no motivation to substitute the quaternary ammonium salts of Weber for the quaternary ammonium salts of Chauvin. Applicants note that Weber discloses a rubber composition, which contains, among other things, a “reinforcing filler consisting essentially of particulate carbon black.” Weber, col. 2, line 63 – col. 3, line 10 (emphasis added). The transition phrase “consisting essentially of” limits the scope of a claim to the specified materials that do not materially affect the basic and novel characteristics of the claimed invention. See M.P.E.P. § 2111.03. The specification discloses that “[t]he use of silica-based reinforcing fillers involves several drawbacks, substantially related to the poor affinity of the same with respects to the elastomeric polymers commonly used in the tyre manufacture.” Specification as-published at ¶ [0006]. Accordingly, the issue here is not simply substituting one salt for another. Rather, because at the time of filing, a person of ordinary skill in the art would expect drawbacks to the proposed combination, such a person would not have been motivated to make the proposed substitution.

¹ Weber also discloses the use of the quaternary ammonium salt as a coupling agent, whereas the specification of the instant application describes the claimed quaternary ammonium salts as a “secondary accelerator.” Specification as-published at ¶ [0014]. Nothing in Weber teaches or suggests that the disclosed quaternary ammonium salt will act as a “second accelerator.”

Accordingly, Applicants respectfully request that the Examiner withdraw this rejection for at least these reasons.

E. Chauvin in view of Weber and further in view of Lucas

The Examiner rejects claims 75, 87, and 99 under 35 U.S.C. § 103(a) as being unpatentable over Chauvin and Weber as applied in claims 74, 86, and 98 above and further in view of Lucas. See Nov. 15, 2007, Office Action at 6-7. The Examiner concedes that Chauvin “fails to expressly suggest the inclusion of a silica coupling agent,” but asserts that such an additive is conventionally added to compositions containing silica. See *id.* at 6. The Examiner relies on Lucas, which discloses the use of a silica coupler with a silica filler, in an attempt to cure the deficiency of Chauvin.

Applicants respectfully traverse this rejection for at least the following reason.

As discussed above, there is no motivation to substitute the quaternary ammonium salts of Weber for the quaternary ammonium salts of Chauvin. Lucas also fails to provide the necessary motivation, which Chauvin, Weber, or Burke are lacking, to select the claimed quaternary ammonium salt. Thus, Applicants respectfully request that the Examiner withdraw this rejection for at least this reason.

Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration of this application and the timely allowance of the pending claims.

If the Examiner believes a telephone conference could be useful in resolving any outstanding issues, he is respectfully invited to contact Applicants' undersigned counsel at (202) 408-4152.

Please grant any extensions of time required to enter this response and charge
any additional required fees to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: May 14, 2008 By: 
Aaron M. Raphael
Reg. No. 47,885

Attachments: Redicote® E11 Safety Data Sheet from Akzo Nobel; and
Aliquat® 336 Product Data Sheet



SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY UNDERTAKING

Trade name **REDICOTE® E11**

Chemical description/Application Emulsifier

Supplier Akzo Nobel Surface Chemistry Pte Ltd
41 Science Park Road #03-03
The Gemini, Singapore Science Park II
SINGAPORE 117610
Tel: +65 6773 8488
Fax: +65 6773 8484

Emergency telephone +65 63162701 x 112 (Akzo Nobel Surface Chemistry Pte Ltd)
+31 570679211 (Akzo Nobel Chemicals, The Netherlands)

Producer Akzo Nobel Surface Chemistry Pte Ltd
40 Jurong Island Highway, Jurong Island
Singapore 627830
Tel: +65 63162701*112

2. COMPOSITION/INFORMATION ON INGREDIENTS

This product is to be considered as a preparation according to EU-legislation.

Substance name	EU number	CAS number	Concentration	Symbols	Risk phrases
N,N,N',N'-Pentamethyl-N-tallowal kyl-chloride	271-762-1	68607-29-4	~50 %	Xn ,N	*R-22, 50/53
2-Propanol	200-661-7	67-63-0	~35 %	Xi ,F	R-11, 36, 67
Water	231-791-2	7732-18-5	~15 %	-	

Other information All components are registered in EINECS. * Classification of the substance with respect to irritating effects is not relevant for the product classification.

3. HAZARDS IDENTIFICATION

Highly flammable. Above the flash point an explosive mixture can be formed. Harmful. Harmful if swallowed. Irritating to skin. Risk of serious damage to eyes. Vapours may cause drowsiness and dizziness. Dangerous for the environment. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

4. FIRST AID MEASURES

General Obtain medical attention immediately (show this Safety Data Sheet).

Inhalation Provide fresh air, warmth and rest, preferably in a comfortable upright sitting position. If breathing stops, provide artificial respiration. Obtain medical attention.

Skin Remove contaminated clothing. Wash the skin with soap and water. Seek medical advice if symptoms appears.

Eyes Immediately rinse with water for several minutes. Hold eyelids apart. Get medical attention immediately. Continue to rinse during transport.

Ingestion	Only when conscious, rinse mouth, give plenty of water to drink (approx. 500 ml). Obtain medical attention.
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5. FIRE FIGHTING MEASURES

Extinguishing media	Water spray, fog or mist, alcohol resistant foam, powder, carbon dioxide.
Unsuitable extinguishing media	Waterjet, foam.
Special fire fighting procedures	Treat as an oil fire. Water spray may be ineffective unless used by experienced fire fighters. Wear self contained breathing apparatus.
Unusual fire hazards	Above the flash point an explosive mixture can be formed. If involved in a fire it will support combustion and may decompose to give off toxic materials. In case of fire and/or explosion do not breathe fumes.
Hazardous combustion products	No typical hazardous decomposition products known.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	For personal protection see Section 8.
Environmental precautions	Should not be allowed to enter drains or water courses. Dispose of this material and its container at hazardous or special waste collection point.
Methods for cleaning up	Contain spill with inert material. Place in container for disposal according to local regulations. Cover the remainder with inert absorbent (e.g. vermiculite) for disposal. In case of large spillages contact the local authority.

7. HANDLING AND STORAGE

Handling	The usual precautions for flammable liquids should be observed. When using do not eat, drink or smoke. Avoid spilling, skin and eye contact. No sparking tools should be used.
Storage	Keep away from heat, sparks and open flame. No smoking. To maintain quality: Store at ambient temperatures. Avoid elevated temperatures. For further information see product information sheet.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limits

Ingredient name	Exposure limit 8 hours	Short term exposure	References
2-Propanol	400 ppm	500 ppm	OES.

Comments OES = EH40/2002 Occupational Exposure Limits 2002.

Engineering controls Provide eyewash station. Provide shower facilities near the work place. Mechanical ventilation or local exhaust ventilation may be required.

Personal protection

Respiratory	If ventilation is insufficient, suitable respiratory protection must be provided. Wear full face mask supplied with: Combination filter ABEKP.
Hand	Neoprene or nitrile.
Eyes	Wear tightly fitting safety goggles.
Skin and body	Use suitable protective clothing as protection against splashing or contamination. Launder clothes before re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Liquid.		
Colour	Yellow.		
Odour	2-Propanol.		
Boiling point/range (°C)	-	Pressure (kPa)	
Melting point/range (°C)	< -20		
Flash point (°C)	~ 18	Method	Abel-Pensky DIN 51755
Autoignition temperature (°C)	** 460		
Lower explosion limit (vol %)	** 2		
Upper explosion limit (vol %)	** 13		
Vapour pressure	-	Temperature (°C)	
Relative vapour density (air=1)	** 2		
Density (kg/m³)	900	Temperature (°C)	20
Viscosity	< 50 mPas	Temperature (°C)	20
pH value	-		
pH value diluted solution	6-9	Conc. (%)	*
Solubility in water	Soluble.		
Solubility in other solvents	-		
Other physical data	** 2-Propanol.		

(These data are typical for the product and not a specification)

10. STABILITY AND REACTIVITY

Stability	Avoid elevated temperatures. Stable under recommended storage and handling conditions (see section 7).
Hazardous decomposition products	No typical hazardous decomposition products known.

11. TOXICOLOGICAL INFORMATION

Toxicological data

Health effects

Respiratory	The inhalation of aerosols may cause irritation of the respiratory tract. Contains solvent. Emits vapours during heating. High concentrations may cause stupor, dizziness, nausea, vomiting.
Skin	Irritating. May cause transient redness and pain.
Eyes	May cause severe irritation. Risk of chemical burns.
Ingestion	Harmful if swallowed. May cause irritation to mucous membranes in mouth, throat, stomach and intestinal canal.
Component	N,N,N',N'.N"-Pentamethyl-N-tallowalkyl- 1,3-propanediammonium chloride
Toxicological data	LD50. oral rat 1000-2000 mg/kg

12. ECOLOGICAL INFORMATION

Ecotoxicological data

Ecotoxicology	The product contains substance(s) classified very toxic to aquatic organisms.
Degradation	The product is classified as not readily biodegradable.
Component	N,N,N',N".N"-Pentamethyl-N-tallowalkyl- 1,3-propanediammonium chloride
Ecotoxicological data	LC50 96 hours Brachydanio rerio (fish) < 1 mg/l
Ecotoxicology	Very toxic to aquatic organisms.
Degradation	Not readily biodegradable. <60% BOD, 28 days, Closed Bottle Test (OECD 301D).

13. DISPOSAL CONSIDERATIONS

Disposal methods	Incineration is recommended. Dispose of in accordance with local authority requirements. Nitrous gases may be formed by incineration.
Waste category	Hazardous waste in accordance with the Council Directive 91/689/EEC of 12 December 1991 on hazardous waste.

14. TRANSPORT INFORMATION

Proper shipping name	Flammable liquid, n.o.s. (Quaternary ammonium compound/2-Propanol mixture)		
Land transport			
UN number	1993	RID-class	3
ADR class	3	RID packing group	II
ADR packing group	II		
Classification code	F1		
CEFCI number	30G30	Tremcard internal code	518
Sea transport			
UN number	1993		
IMDG class	3	EmS	F-E, S-E
IMDG packing group	II	Marine pollutant	No.
Air transport			
UN number	1993	Subsidiary risk	
IATA/ICAO class	3	Packing group	II

15. REGULATORY INFORMATION

Substance name	N,N,N',N".N"-Pentamethyl-N-tallowalkyl- 1,3-propanediammonium chloride		
	2-Propanol		
Symbols			



Risk phrases	R-11 Highly flammable. R-22 Harmful if swallowed. R-38 Irritating to skin. R-41 Risk of serious damage to eye. R-67 Vapours may cause drowsiness and dizziness. R-50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety phrases	S-16 Keep away from sources of ignition - No Smoking. S-26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S-28 After contact with skin, wash immediately with plenty of soap and water. S-36/37/39 Wear suitable protective clothing, gloves and eye/face protection. S-57 Use appropriate containment to avoid environmental contamination.
EU directive	Safety Data Sheet according to EC-directive 2001/58/EC
Water hazard classification	WGK: 3 (Germany).

16. OTHER INFORMATION

This information only concerns the above mentioned product as supplied and may not be valid if used with other product(s) or in any process. It remains the user's own responsibility to make sure that the information is appropriate and complete for his special use of this product.

Composed by	Barbro Dihné Eva Cassel
Explanations to R-phrases in section 2	R-22 Harmful if swallowed. R-50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.*R-11 Highly flammable.R-36 Irritating to eyes.R-67 Vapours may cause drowsiness and dizziness.
Date of major revision	2002-07-04
Date of printing	2004-04-29

Aliquat®336

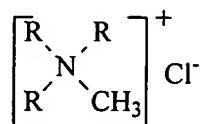
Aliquat 336 is a water insoluble quaternary ammonium salt made by the methylation of mixed tri octyl/decyl amine, which is capable of forming oil soluble salts of anionic species at neutral or slightly alkaline pH.

APPLICATIONS:

- 1) **Solvent Extraction:** Aliquat 336 has been used to recover or purify the following ionic complexes: Cadmium, Cobalt, Iron, Molybdenum, the Rare Earths, Tungsten, Uranium, Vanadium and Zinc. Aliquat 336 has also been used in acid purification.
- 2) **Waste treatment:** Aliquat 336 has been used successfully to recover acids/acid salts or to remove certain heavy metals from wastewater. Aliquat 336 has also been used to control foaming during treatment of wastewaters containing anionic surfactants.
- 3) **Adhesion promoter and surface curing aid** for fluorocarbon elastomers.
- 4) **Anti-static agent:** for textile fabrics and carpeting.
- 5) **Decolorization and deodorization:** of fermentation broths.

Chemistry:

Aliquat 336 is composed of a large organic cation associated with a chloride ion, as shown below.



Because the ammonium structure has a permanent positive charge, it can form salts with anions over a wider pH range than primary, secondary or tertiary amines. For this reason, **Aliquat 336** finds application in environments from acid to slightly alkaline pH.

When used as reagent in solvent extraction, the Aliquat 336 first extracts the target species from an aqueous solution and then must be regenerated (stripped) for recovery of the target species and reuse of the reagent to recover additional amounts of the targeted species. Due to the fixed cationic charge on the quaternary ammonium ion, Aliquat 336 is more difficult to strip than amines. Adjusting the pH of the aqueous will control loading and stripping with amines but not with quaternary amines. Successful strategies for stripping a quaternary ammonium extractant involve either changing the nature of the extracted anion to a species that is less readily extracted or crowding the extracted anion off the quaternary ammonium ion using a high concentration of an alternate anion such as chloride in the aqueous stripping solution or with an anion that is more readily extracted.

In some instances, it may be preferable to work with a chloride free system. This is especially true in the case of phase transfer catalyst applications where the chloride may interfere with transfer of a reactant. In these cases, it may be desirable to exchange the chloride anion for some other anion such as bisulfate. (Request bulletin "Converting Aliquat 336 chloride to hydrogen sulfate")

TYPICAL ANALYSIS:

% Quaternary salt content	88.2-90.6	Acid value + Amine value	≤ 3.0
Color (Gardner)	≤ 5	% Water	≤ 5
Appearance.....amber colored, viscous liquid		

Chemical and Physical Properties

Property		Property				Property			
Average Molecular Weight	442	Viscosity (Brookfield)				Thermal Stability*			
Specific Gravity(25°C/25°C)	0.88	4°C		6300cps		Temp	4 hours	8 hours	
Pour Point (ASTM)	-14°C	30°C		1450cps			III°	IV°	
Flash Point (ASTM)	132°C	60°C		197cps		25°C	0.28	10.1	0.37
Surface Tension(dynes/cm)	28	Solubility**	0°C	8°C	30°C	60°C			10.0
Interfacial Tension (dynes/cm)		Benzene	-	100	100	100	60°C	1.14	9.4
1.0% Nujol Solution	1.6	Chloroform	100	100	100	100	100°C	9.21	1.3
0.1% Nujol Solution	3.1	Isopropanol	100	100	100	100	Control	0.22	10.2
0.01% Nujol Solution	20.6	Kerosene***	100	100	100	100	(0 hour)		
		Water****	-	-	0.12	0.2			

* Stability tests were done by stirring equal volumes of 10w/v% Aliquat 336 in xylene and 50% aqueous NaOH at elevated temperatures. Samples were titrated for tertiary amine (III°) and quaternary salt (IV°) values.

** (g/100g solvent)

*** Increasing aromatic content of kerosene results in increased solubility.

**** The distribution of Aliquat 336 into an aqueous phase from kerosene would be much lower than the solubility of Aliquat 336 in the aqueous phase.

Availability:

Aliquat 336 is available in bulk, totes (net 1950 pounds) and drums (net 390 pounds), F.O.B. Kankakee, IL. Pint samples of Aliquat 336 are also available.

Safety:

Material safety data sheet (MSDS) available on request.

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Aliquat®336